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PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

MISSOURI HEADWATERS BASIN
SOUTH MEADOW CREEK LAKE DAM
MADISON COUNTY, MONTANA
MT-527

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PREPARED FOR:

HONORABLE TED SCHWINDEN
GOVERNOR, STATE OF MONTANA

SOUTH MEADOW CREEK LAKE DAM, INC.
(OWNER/OPERATOR)

PREPARED BY:
HOSKINS-WESTERN-SONDEREGGER, INC.

MAY, 1981

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TABLE OF CONTENTS

Paragraph		Page
	EXECUTIVE SUMMARY	i
	PERTINENT DATA	iii
	CHAPTER 1 - BACKGROUND	
1.1	INTRODUCTION	1
1.1.1	Authority and Scope	1
1.1.2	Purpose	2
1.1.3	Inspection	2
1.2	DESCRIPTION OF PROJECT	3
1.2.1	General	3
1.2.2	Regional Geology	3
1.2.3	Seismicity	4
1.2.4	Site Geology	5
1.2.5	Design and Construction History	5
	CHAPTER 2 - INSPECTION AND RECORDS EVALUATION	
2.1	HYDRAULICS AND STRUCTURES	6
2.1.1	Spillway	6
2.1.2	Outlet	6
2.1.3	Freeboard	7
2.2	HYDROLOGY, CLIMATOLOGY, AND PHYSIOGRAPHY	7
2.2.1	Climatology and Physiography	7
2.2.2	Reservoir and Spillway Discharge	8
2.2.3	Estimated Probable Maximum Flood	8
2.2.4	Flood Routing	9
2.3	GEOTECHNICAL EVALUATION	9
2.3.1	Embankment	9
2.3.2	Foundation Conditions, Seepage, and Drainage	10
2.3.3	Stability	10
2.4	PROJECT OPERATION AND MAINTENANCE	10
2.4.1	General	10
2.4.2	Dam	11
2.4.3	Reservoir	11
2.4.4	Warning System	11

CHAPTER 3 - FINDINGS AND RECOMMENDATIONS

3.1	FINDINGS.	12
3.1.1	Size, Hazard Classification, and Safety Evaluation .	12
3.1.2	Dam Embankment	12
3.1.3	Spillway	12
3.1.4	Outlet Works	12
3.1.5	Spillway and Reservoir Capacity.	13
3.1.6	Operation and Maintenance.	13
3.2	RECOMMENDATIONS	13
	REFERENCES.	15

PHOTOS

1	Overview, South Meadow Creek Lake Dam	16
2	Upstream Face from Left Abutment	16
3	Downstream Face from Left Abutment	17
4	Borrow Area in Left Abutment	17
5	Spillway Approach Channel, Looking Upstream	18
6	Spillway Sill and Exit Channel, Looking Downstream	18
7	Spillway Exit Channel	19
8	Low-Level Inlet Structure and Trash Rack	19
9	Low-Level Gate Well and Control Works on Berm	20
10	Conduit Outlet and Downstream Face of Dam	20
11	Flow-Measuring Flume below Dam	21
12	Downstream from Crest of Dam	21
13	Reservoir and Drainage Area	22

PLATES

1	Site Plan and Vicinity Map
2	Dam Cross Section at Outlet
3	Dam Center Line Profile
4	Profile of Spillway Center Line, Typical Cross Section Downstream of Crest, and Cross Section at the Crest
5	Elevation - Area and Storage Curves

6	Spillway Discharge Rating Curve
7	24" CMP Discharge Rating Curve
8	South Meadow Cr. Lake Dam Rehabilitation - Construction Details
9	South Meadow Cr. Lake Dam Rehabilitation - Construction Details
10	South Meadow Cr. Lake Dam Rehabilitation - Construction Details

EXECUTIVE SUMMARY

Under contract with the Seattle District Corps of Engineers and with representation from the Corps, the Owner, and the State of Montana Department of Natural Resources and Conservation, South Meadow Creek Lake Dam was inspected by Hoskins-Western-Sonderegger, Inc., on 18 September 1979, under the authority of Public Law 92-367. South Meadow Creek Lake Dam is located in Madison County, Montana, approximately 10 miles west of McAllister.

This report was compiled from information obtained during an on-site inspection, a review of operation records, and analysis of hydrologic and hydraulic data. Findings were compared to engineering criteria currently accepted by most private and public agencies engaged in dam design, construction, and operation.

PRINCIPAL FINDINGS AND EVALUATIONS

South Meadow Creek Lake is operated under a special-use permit from the U.S. Forest Service. It is used primarily for irrigation storage and secondarily for recreation. The project consists of a natural glacial lake and an embankment to raise the lake elevation for irrigation storage. The reservoir has a drainage area of approximately 1.6 square miles, surface area of approximately 77 acres at normal pool, and storage at the minimum dam crest of approximately 1130 acre-feet.

In accordance with the "Recommended Guidelines for Safety Inspection of Dams" (Ref. 1), the 16-foot-high South Meadow Creek Lake Dam (MT-527) is classified as being of intermediate size and as having a high (Category I) downstream hazard potential, due to the presence of more than 10 inhabitable structures below the dam.

Inspection criteria (Ref. 1) recommend that an intermediate-sized project with a high downstream hazard potential be capable of safely handling a flood equal to the probable maximum flood (PMF). The PMF is the flood expected from the most severe combination of meteorologic and hydrologic conditions that are reasonably possible in the region.

During the dam safety analysis, an estimated PMF was developed for the drainage basin resulting from the 24-hour probable maximum precipitation (PMP). The resulting PMF has a volume of approximately 1270 acre-feet. The reservoir level at the beginning of the 24-hour storm was assumed to be at the spillway crest elevation. Reservoir routings of the estimated 24-hour PMF indicated that the project will handle approximately 54% of the PMF volume before overtopping if the low-level outlet is fully closed or approximately 55% of the PMF volume before overtopping if the low-level outlet is fully open. The dam is constructed of materials that will erode and fail when overtopped by floodwaters. Such failure could endanger the lives of many people and cause considerable property damage.

On the basis of the field inspection and the study of hydrologic and operational data, South Meadow Creek Lake Dam does not conform to inspection guidelines with respect to discharge and/or storage capacity to safely handle the full PMF. This inability to handle the PMF could lead to loss of life and property destruction.

Evidence of foundation or embankment seepage was found all along the downstream toe of the embankment, in the abutment troughs, and above the left side of the conduit outlet structure. No piezometers are installed to measure water levels in the embankment or foundation, and there is no internal drainage system. However, conditions described in this report suggest that the dam conforms to the criteria in the recommended guidelines (Ref. 1) with respect to slope stability, subject to verification of design assumptions.

PRINCIPAL RECOMMENDATIONS

Due to the availability of storage between the normal pool and the dam crest, the present project provides a degree of flood protection to the downstream area. The intent of report recommendations is to maintain or improve project safety, if feasible, without decreasing this existing flood protection.

Immediately develop, implement, and periodically test an emergency warning plan for use in the event of dam overtopping. Establish a formal maintenance plan.

Conduct more-detailed hydrologic and hydraulic routing studies to better determine the downstream hazard and required spillway capacity. Modify the project as studies indicate.

Investigate embankment materials and verify stability. Studies should be performed by a geotechnical engineer experienced in the design and construction of earth dams.

Prior to performing engineering studies and remedial construction, coordinate all work with the U.S. Forest Service and the State of Montana Department of Natural Resources and Conservation to insure compliance with all pertinent laws and regulations.

Stephen H. Nickel
Professional Engineer

PERTINENT DATA

1. GENERAL

Federal Identification Number	MT-527
Owner/Operator	South Meadow Creek Lake Dam, Inc.
Purpose	Irrigation storage
Location	Sec. 25, T4S, R3W Madison County, Montana
Watershed	South Meadow Creek
Downstream Hazard Potential	High (Category I)
Size Classification	Intermediate
USGS Quadrangle	Virginia City, Montana

2. RESERVOIR

Surface Area at Normal Pool (Spillway Crest)	77 acres
Normal Storage (Spillway Crest)	625 acre-feet
Total Storage (Min. Dam Crest)	1130 acre-feet
Surcharge Storage	505 acre-feet
Drainage Area	1.6 square-miles
Reservoir Water Surface Elev. (9/18/79)	8683.0 feet (NGVD)

3. SPILLWAY

Type	Uncontrolled earth and rock channel with concrete sill at crest
Crest Elevation	8690.0 feet (NGVD)
Crest Width	15 feet (approx.)
Spillway Capacity (Min. Dam Crest)	1160 cfs

4. OUTLET WORKS

Type	Controlled, corrugated metal pipe with trash rack at upstream end
Controls	Rising stem slide gate with enclosed manual control from berm
Size	24-inch diameter
Length	87 feet
Inlet Invert	8682.5 feet (NGVD)
Outlet Invert	8680.0 feet (NGVD)
Normal Tailwater	Unknown
Discharge Capacity (Min. Dam Crest)	38 cfs

5. DAM

Type	Earth
Hydraulic Height	16 feet
Crest Length	345 feet
Minimum Crest Elevation	8695.6 feet (NGVD)
Crest Width	11 feet
Upstream Slope	1(V) on 3.2(H) for upper 6 feet above 12-foot berm; 1(V) on 3.9(H) below
Downstream Slope	1(V) on 1.8(H)

Note: All elevations are referenced from the assumed spillway crest elevation of 8690.0 feet above the National Geodetic Vertical Datum (NGVD).

CHAPTER 1

BACKGROUND

1.1 INTRODUCTION

1.1.1 Authority and Scope

This report summarizes the Phase I inspection and evaluation of South Meadow Creek Lake and Dam, owned and operated by South Meadow Creek Lake Dam, Inc., of McAllister, Montana.

The National Dam Inspection Act, Public Law 92-367 dated 8 August 1972, authorized the Secretary of the Army, through the Corps of Engineers, to conduct safety inspections of non-federal dams throughout the United States. Pursuant to that authority, the Office of the Chief of Engineers issued "Recommended Guidelines for Safety Inspection of Dams" (Ref. 1) in May 1975.

The recommended guidelines were prepared with the help of engineers and scientists, highly experienced in dam safety, from many federal and state agencies, professional engineering organizations and private engineering consulting firms. Consequently, the evaluation criteria presented in the guidelines represent the comprehensive consensus of the engineering community.

Where necessary, the guidelines outline a two-phased study procedure for investigating and evaluating existing dam conditions so deficiencies and hazardous conditions can be readily identified and corrected. The Phase I study is:

(1) a limited investigation to assess the general safety condition of the dam;

(2) based upon an evaluation of the available data and a visual inspection;

(3) performed to determine if any emergency measures and/or additional studies, investigations and analyses are necessary or warranted; and

(4) not intended to include extensive explorations or analyses or to provide detailed alternative correction recommendations.

The Phase II investigation includes all additional studies necessary to evaluate the safety of the dam. Included in Phase II, as required, should be additional visual inspections, measurements, foundation exploration and testing, materials testing, hydraulic and hydrologic analyses, and structural stability analyses.

The authority for the Corps of Engineers to participate in the inspection of non-federally owned dams is limited to Phase I investigations with the exception of situations of extreme emergency. In these cases the Corps may proceed with Phase II studies, but only to the extent needed to answer serious questions relating to dam safety that cannot be answered otherwise. The two phases of investigations outlined above are intended only to evaluate project safety and do not encompass in scope the engineering required to perform design or corrective modification work. Recommendations contained in this report may be for either Phase II safety analyses or detailed design study for corrective work.

The responsibility for implementation of these Phase I recommendations rests with the dam owner and the State of Montana. It should be noted that nothing contained in the National Dam Inspection Act, and neither action nor failure to act under this Act shall be construed (1) to create liability in the United States or its officers or employees for the recovery of damage caused by such action or failure to act or (2) to relieve an owner or operator of a dam of the legal duties, obligations, or liabilities incident to the ownership or operation of the dam.

1.1.2 Purpose

The purpose of the inspection and evaluation is to identify conditions that threaten public safety, so that they may be corrected in a timely manner by non-federal interests.

1.1.3 Inspection

The findings and recommendations in this report were based upon visual inspection of the project, as well as an interview with a representative of the owners. Records of recent Forest Service inspections and the SCS reports and construction drawings of the last major dam reconstruction (1968) were provided for reference. Inspection procedures and criteria were those established by the "Recommended Guidelines for Safety Inspection of Dams" (Ref. 1).

Personnel present during the inspection included:

Louis Boitano, Civil Engineer, Seattle District Corps of Engineers;
Art Taylor, State of Montana, Department of Natural Resources and Conservation; and
Ora Megee, President, South Meadow Creek Lake Dam, Inc.

Hoskins-Western-Sonderegger, Inc. personnel who participated in the field inspection and contributed to this report are:

Stephen Nickel, Geotechnical Engineer, Team Leader;
Michael McMeekin, Hydrologist/Hydraulics Engineer; and
Gene Holtorf, Hydrologist/Hydraulics Engineer.

This report has been reviewed by representatives of South Meadow Creek Lake Dam, Inc., the State of Montana Department of Natural Resources and Conservation, the U.S. Forest Service, and the SCS. Their written comments are included in the Appendix of this report.

1.2 DESCRIPTION OF PROJECT

1.2.1 General

South Meadow Creek Lake Dam (MT-527), owned by South Meadow Creek Lake Dam, Inc., forms what is primarily an irrigation impoundment. The lake is located at the headwaters of South Meadow Creek, in Sections 25 and 26, T4S, R3W, Madison County, Montana, approximately 10 miles west of McAllister. The lake is an old glacial cirque lake that was enlarged for irrigation storage by the construction of a dam. South Meadow Creek Lake has a drainage area of approximately 1.6 square miles, surface area of approximately 77 acres and storage of approximately 625 acre-feet at the spillway crest elevation of 8690.0 feet, and maximum storage of 1130 acre-feet at the minimum dam crest elevation of 8695.6 feet. The project is operated under a special-use permit from the Forest Service.

The spillway, located at the right dam abutment, is an uncontrolled earth and rock channel discharging to South Meadow Creek. A 24-inch-diameter corrugated metal pipe, encased in concrete and having a wet well and manually controlled vertical slide gate near the upstream end of the pipe, make up the irrigation outlet works for the dam. The outlet works are located through the embankment, approximately 145 feet south of the left dam abutment.

South Meadow Creek Lake Dam is approximately 16 feet high and impounds approximately 1130 acre-feet at the minimum dam crest elevation. Based upon visual reconnaissance and engineering judgment, more than 10 inhabitable structures could be affected by a sudden breach of the dam. South Meadow Creek Lake Dam, therefore, is classified as intermediate in size and as having a high (Category I) downstream hazard potential classification (Ref. 1).

1.2.2 Regional Geology

South Meadow Creek Lake Dam is in the Tobacco Root Mountains. The Tobacco Root Mountains are bounded on the north by the Jefferson River Valley, on the east by the Madison River Valley, on the west by the Beaverhead River Valley, and on the south by the Gravelly-Greenhorn Mountain Ranges.

The Tobacco Root Mountains have an igneous batholitic intrusion as a core, with older metamorphic and sedimentary rocks mantling the igneous core. Associated with igneous intrusion, but not contemporaneous, is the structural development of the mountains by block faulting and thrust faulting. Present surficial sediments have a glacial origin at higher elevations and, near the valley floor, in the lower elevations, are loosely consolidated (valley-fill) sediments.

The northern Rocky Mountain region prior to Late Cretaceous time was essentially a flat plain partially flooded by shallow seas. At the end of the Mesozoic

Era, of which the Cretaceous is the last geologic epoch, this entire area became geologically active. Three things exemplify this activity: (1) Cretaceous uplift; (2) Late Cretaceous thrust faulting; and (3) Late Cretaceous-Tertiary intrusive activity, i.e., the Tobacco Root Batholith. The regional uplifting of the continental crust brought the earth up in several north-south trending blocks. The west sides of the faulted blocks, or mountains, are higher in elevation and have characteristically abrupt scarps, while the east sides of the blocks have long, gentle slopes.

The uplifted land then became subjected to erosion. As the sediments were transported downslope, they filled the intermountain valleys with debris ranging from muds and sands to gravels and cobbles. These valley-fill sediments attain a depth of several thousand feet in the axis of the mountain valleys.

Pleistocene alphine glaciation of Wisconsin Age (12,000 years before present) sculptured typical alpine glacial features including cirques, headwalls, and troughs in the upper elevations of the Tobacco Root Mountains. In lower elevations, glacial deposits of terrace gravel, stream bed alluvium, landslide rubble, and glacial drift occur.

1.2.3 Seismicity

South Meadow Creek Lake Dam (MT-527), located in the Tobacco Root Mountains, lies in Seismic Zone 3 as indicated by the Seismic Zone Map (Ref. 1). The seismic probability of this regional setting is one of potential for major damage and is based on the known distribution of damaging earthquakes in the region.

The "Preliminary Map of Young Faults in the United States", by the U.S. Geological Survey (Ref. 2), indicates suspected activity along the northwestern expanse of the Tobacco Root Mountains during Holocene time. Major faulting has also occurred prior to the Cenozoic Era in the western and northern regions of the Pioneer Mountains according to the Montana State Geologic Map.

Local earthquakes significant enough to be reported in References 3 and 4 occur in 2 epicentral areas. One of these is to the northeast along a line from 20 miles northwest of Helena to 25 miles north of Bozeman, while the other is to the southeast in northeast Idaho, northwest Wyoming, and the adjoining area of Montana. Of these two epicentral areas the one is 20-70 miles to the south-southeast, and the other is 40-75 miles to the north of the project site. Two earthquakes of significant intensity that occurred in the tri-state region southeast of the project site were the Hebgen Lake, Montana, earthquake (8 August 1959), that had an intensity of X (Modified Mercalli), and another southeast of Dillon, Montana, and south of the project area (23 November 1947), that had an intensity of VIII. The three largest reported earthquakes northeast of the Tobacco Root Mountains have had intensities of VIII. One of these earthquakes had its epicenter at a point 25 miles north of Bozeman (27 June 1925), while the other two occurred at Helena (18 October and 31 October 1935).

In the vicinity of the project there have been numerous other earthquakes in this century (Ref. 3 and 4). In an area bounded by the 44th and 46th parallels and by the 110th and the 112th meridians (including the tri-state region), there have been more than 50 earthquakes with intensities of V and more than 10 with intensities of VI. The closest reported earthquakes to the project site have occurred near Ennis and Virginia City. The largest of these had an intensity of VI and occurred near Ennis (10 March 1977). The exact distance from the epicenter of this earthquake to the project site is not known.

The Tobacco Root Mountains lie in a seismically active area with the potential for a damaging earthquake. This warrants that special attention be given to the dams in the area that have been constructed without consideration given to the effects of earthquakes.

1.2.4 Site Geology

South Meadow Creek Lake is in an outcrop area of a series of Precambrian metamorphic and sedimentary rocks, with local dip to the northeast. Numerous igneous pegmatite dikes and sills of post-Cambrian age intrude these rocks. The lake lies in a large cirque basin between steep (50% to 70%) troughwalls. The dam is built on a terminal moraine, across the outlet of the natural lake impounded by the moraine. The morainal material is a sandy silt matrix, containing cobbles and boulders. Where the stream has flowed, some or all of the silt has washed away, leaving a permeable zone. The plans show this zone to be cut off by an upstream core trench.

1.2.5 Design and Construction History

South Meadow Creek Lake Dam was originally constructed around 1902 and, according to the owner, has been rebuilt several times since then. In 1965 the dam was determined to be unsafe for water storage. Consequently, it was completely reconstructed in 1968. The design work was performed by the Soil Conservation Service (SCS), and construction was undertaken by the owner with guidance from the SCS. The project involved the following: construction of an access road; removal of the old structure; installation of new irrigation outlet works; construction of a spillway channel with a concrete sill; construction of the core and earth embankment; and miscellaneous related work.

In designing the project, the SCS considered the dam to be a Class "a" structure, or one which is "located in a rural or agricultural area where failure may damage farm buildings, agricultural land, or township and country roads" (Ref. 5). The design flood for the project was the 100-year flood.

CHAPTER 2

INSPECTION AND RECORDS EVALUATION

2.1 HYDRAULICS AND STRUCTURES

2.1.1 Spillway

The spillway is located at the right dam abutment and discharges into South Meadow Creek. The spillway is an uncontrolled, earth and rock channel with a concrete sill at the crest. The sill is an 8-inch-thick reinforced concrete wall with a 15-foot-wide, flat crest and sloping sides which conform to those of the spillway channel (see Plate 9). Upstream from the crest, the channel is fairly regular with some rocks and boulders. A log boom for the spillway is located approximately 30 feet upstream from the crest. Another log boom, which protects the entire dam as well as the spillway, is about 100 feet farther upstream. The channel downstream from the crest becomes narrower and deeper, with more irregularities and boulders and some debris. The slope of the upstream channel varies from 1% to 6%. The channel downstream from the crest varies in slope from 4% to 25%, until its confluence with South Meadow Creek. The spillway channel and concrete sill can be seen in Photos 5, 6, and 7, and the profile and typical cross sections can be seen on Plate 4.

The spillway channel appears to be in generally good condition, with no serious erosion damage, but some side-slope sloughing along the channel downstream from the crest. It is not known whether the spillway has ever operated. The log booms seem to be operating and in good condition, as the spillway channel has very little debris.

The discharge rating for the spillway was computed by assuming critical depth at the channel crest and computing water surface profiles upstream in the reservoir, using a Mannings "n" varying from 0.025 to 0.040. The capacity of the spillway varies from 0 cubic feet per second (cfs) at the spillway crest elevation of 8690.0 feet to 1160 cfs at the minimum dam crest elevation of 8695.6 feet. A complete discharge rating curve for the spillway is shown on Plate 6.

2.1.2 Outlet

An irrigation outlet is located through the embankment, approximately 145 feet south of the left dam abutment. The outlet consists of 87 feet of 24-inch-diameter, concrete-encased, corrugated metal pipe and a wet well with a manually controlled vertical slide gate located near the center of the wet well. Stop logs, located in the wet well, can be used to vary the normal pool elevation (see Plates 2 and 10). The invert of the upstream end of the pipe has an elevation of 8682.5 feet, which is 13.1 feet below the minimum dam crest. The invert of the downstream end of the pipe has an elevation of 8680.0 feet, which is 15.6 feet below the minimum dam crest. A trash rack and inlet structure is located at the

upstream end of the conduit, and a concrete headwall and wing walls form an outlet structure at the downstream end of the conduit. A steel-lined, concrete, flow-measuring flume is located approximately 50 feet downstream from the conduit outlet. The irrigation outlet works and the above-mentioned structures can be seen in Photos 8 through 12.

The irrigation outlet facilities appear to be in very good condition. The trash rack bars show some minor rusting. The concrete inlet structure has no noticeable surface deficiencies. The stop logs in the wet well were in good condition. At the time of inspection, it appeared that they were at the same elevation as the spillway and were seldom, if ever, varied. The gate controls are in very good operational condition, except for some very slight leakage with the gate in the closed position. The concrete-encased, corrugated metal pipe conduit has very little surface rust and no noticeable misalignment. Only the exposed portions of the corrugated metal pipe conduit could be inspected. The concrete in the conduit outlet structure has some surface chips but, otherwise, is in good condition.

The capacity of the irrigation outlet, assuming the water level to be at the minimum dam crest elevation and the control gate to be fully open, was computed to be 38 cfs. This capacity was based upon full pipe flow using a Manning's "n" of 0.024. The complete outlet discharge rating curve can be seen on Plate 7.

2.1.3 Freeboard

The normal pool elevation of South Meadow Creek is assumed to be the minimum crest elevation of the spillway, 8690.0 feet. Thus, the vertical distance between the normal pool and the minimum dam crest is 5.6 feet. The effective fetch for wind-generated waves is approximately 0.33 miles. The total wave run-up and wind set-up is approximately 2.3 feet (Ref. 6). Therefore, the freeboard between the minimum dam crest elevation and the wave height elevation above the normal pool elevation is 3.3 feet. With the surface of the water at the minimum crest of the spillway, 3.3 feet of freeboard above the wave height would probably be adequate protection in accordance with criteria in Reference 7.

Routings indicate that the dam will be overtopped during the probable maximum flood. No freeboard exists, therefore, during the PMF (see Section 3.1.1).

2.2 HYDROLOGY, CLIMATOLOGY, AND PHYSIOGRAPHY

2.2.1 Climatology and Physiography

The climate of the area around South Meadow Creek Lake is continental and characterized by a large daily and seasonal temperature range. Extreme variability of wintertime temperatures results from frequent occurrence of chinook winds which follow a Pacific maritime air mass invasion. The summers are characterized by warm days with low humidity and cool nights. Winters are cold and highly variable in severity from year to year and within a given year.

Ennis, located in Madison County at an elevation of 4985 feet, is the climatological station nearest the damsite. Precipitation and climatological data from this station are not applicable to the damsite because of the 3700-foot elevation difference between South Meadow Creek Lake and the weather station. The average annual precipitation at South Meadow Creek Lake is approximately 40 inches (Ref. 8). The average expected date of first freeze is September 2nd, and the average expected date of last freeze is June 29th (Ref. 9).

The drainage basin above and including South Meadow Creek Lake has an area of approximately 1.6 square miles. There are no developed, perennial tributaries draining into the lake. Basin elevations range from the spillway crest elevation of 8690.0 feet to approximately 10,080 feet at the drainage divide. Basin vegetation consists of moderately thick pine and sparse grasses in the lower basin area to sparse pine on extremely rocky surfaces in the upper basin area (see Photos 4, 5, and 13).

2.2.2 Reservoir and Spillway Discharge

South Meadow Creek Lake has a surface area of approximately 77 acres and storage of approximately 625 acre-feet at the spillway crest elevation of 8690.0 feet. Approximately 505 acre-feet of storage are available between the spillway crest and the minimum dam crest elevation of 8695.6 feet (Plate 5). Discharge through the spillway with the water at the minimum dam crest is approximately 1160 cfs. Discharge through the irrigation outlet under these conditions would result in an additional 38 cfs with the control gate in the fully-opened position. Complete discharge rating curves for the spillway and irrigation outlet are shown on Plates 6 and 7, respectively.

2.2.3 Estimated Probable Maximum Flood

The probable maximum flood (PMF) is the flood expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region. A storm, the intensity of which approached probable maximum precipitation (PMP) intensity, did occur in some parts of Montana in June 1964.

A PMP storm of 24-hour duration was applied to the South Meadow Creek Lake drainage basin. The 24-hour, 12-hour, 6-hour, and 1-hour PMP depths were estimated from National Weather Service Technical Paper 38 (Ref. 10) to be 15.2 inches, 13.2 inches, 11.2 inches, and 7.1 inches, respectively. All 6-hour increments from 0 to 24 hours were arranged in accordance with criteria in Weather Bureau Hydrometeorological Report No. 43 (Ref. 11).

The PMF was assumed to result from a PMP storm in late spring over frozen ground. Thus, a constant soil loss rate of zero was applied throughout the 24-hour PMP storm, in accordance with Corps of Engineers' recommendations. The resulting overall configuration of the 24-hour storm is not affected by losses in the soil, and basin rainfall is equal to basin runoff for all storm increments. Direct precipitation onto the surface of the lake was also added in with no losses.

2.2.4 Flood Routing

The level of South Meadow Creek Lake at the beginning of the 24-hour PMP storm was assumed to be at the spillway crest elevation of 8690.0 feet, which would correspond to the assumed normal pool conditions. The total volume of the 24-hour PMF for South Meadow Creek Lake is approximately 1,270 acre-feet, with a peak inflow rate of approximately 13,210 cfs. Reservoir routings indicate that, with the control gate of the irrigation outlet closed, the lake will handle, through storage and spillway discharge, approximately 54% of the PMF volume before overtopping. With the control gate of the irrigation outlet fully open, the lake will handle approximately 55% of the PMF volume before overtopping. The dam is constructed of materials that will erode and fail when overtopped by floodwaters.

PMF hydrographs were developed using the SCS dimensionless unit hydrograph. Reservoir routings of the inflow hydrographs were made using the Modified Puls method. The HEC-1 (Dam Safety Version) computer program (Ref. 12) was used for the hydrograph computations and reservoir routings.

2.3 GEOTECHNICAL EVALUATION

2.3.1 Embankment

The 16-foot-high earth dam is 345 feet long and has a crest width of 11 feet. The upstream slope is generally 1(V) on 3.2(H) for the upper 6 feet, above a 12-foot berm, and 1(V) on 3.9(H) below the berm. The downstream slope is approximately 1(V) on 1.8(H) (see Plate 2). According to the as-built plans, borrow for the embankment reconstruction was obtained from a borrow pit just above the left abutment of the dam. The material exposed in the borrow area and on the crest of the embankment is a sandy silt matrix containing gravel, cobbles, and boulders. The plans (see Plates 8-10) show removal of the upstream portion of the previous embankment and removal of all of the previous embankment in the vicinity of the conduit. The reconstruction incorporated an upstream core trench, approximately 5 feet deep, with an 8-foot bottom width, which was to extend through the more permeable surficial soils. The upstream face of the dam, where it is subject to wave action, is protected with riprap that generally ranges in size from 6 inches to 36 inches in diameter.

Vegetation primarily occurs on the downstream face and on the upstream face above the riprap. There is no vegetation on the crest. In the vegetated areas, the coverage is only about 10% (see Photos 1, 2, and 3). The grass that is growing on the downstream slope becomes considerably more dense in the abutment troughs and along the left side of the low-level outlet exit channel (see Photos 3 and 10).

The rock used in the riprap appears to be primarily of metamorphic origin. A granular transition or bedding material between the riprap and the embankment materials was not shown on the plans and was not found in the field.

2.3.2 Foundation Conditions, Seepage, and Drainage

The dam is founded on a morainal deposit of unknown thickness. This material is similar to the material used to reconstruct the embankment and is considered to be relatively pervious. The core trench appears to have been incorporated in the reconstructed embankment to limit seepage in the upper part of the foundation. Considering the pervious nature of the foundation below the core trench, some seepage is to be expected.

At the time of the inspection the reservoir level was at the low-level inlet elevation. The dam was inspected at the end of the irrigation season, so the pool had not been at this level for more than a few weeks. It is not known how quickly the phreatic surface would respond to the variation in the pool level. Free moisture and damp moss was found immediately above the wing walls and headwall of the conduit outlet structure. Although the concrete surfaces of the outlet structure were not damp, water staining indicates that, at times, water seeps down the face of the outlet structure (see Photo 10).

There was nothing to indicate the dam included any type of drain, nor are there any piezometers installed in the dam.

2.3.3 Stability

During design for the reconstruction in 1968, a geological investigation and a stability analysis were performed. Three borings were made to evaluate the foundation conditions and the potential borrow materials. However, no boring logs are available, and no shear strength testing was performed. The stability analysis, as performed by the SCS, was based on data correlated from other sites in the region, where similar materials prevailed. The phreatic surface for any section was assumed to be a straight line between the normal pool elevation at the upstream face and the toe of the embankment at that section. The Swedish Circle method was used for analyses, and safety factors acceptable under the recommended guidelines (Ref. 1) were obtained. However, no mention was made of an analysis which considered seismic effects.

The evidence of seepage in the abutment troughs and above the conduit outlet structure indicates that actual conditions may differ from those assumed in the design analysis. It is our judgment that the embankment probably conforms to the inspection guidelines with respect to stability (Ref. 1); however, insufficient information is available to adequately evaluate the stability.

2.4 PROJECT OPERATION AND MAINTENANCE

2.4.1 General

Operation and maintenance of South Meadow Creek Lake and Dam is the responsibility of South Meadow Creek Lake Dam, Inc., with technical assistance provided by the Forest Service. The special-use permit specifying these responsibilities for the original dam structure was renewed with the

reconstruction of the dam in 1968. Although there is no written plan of operation and maintenance for South Meadow Creek Lake and Dam, records and inspections indicate a favorable history of maintenance and upkeep since the reconstruction.

2.4.2 Dam

Forest Service inspection reports and site evidence indicate a fairly high level of maintenance activity on the dam. Current maintenance needs consist only of painting the rusty steel on the conduit trash rack and on the measuring flume below the dam. Accessibility to the lake and dam is poor; however, according to the owner, the area is visited once a week during the irrigation season.

2.4.3 Reservoir

As previously mentioned, there is no formal plan of operation and maintenance of South Meadow Creek Lake, other than the inferred responsibilities in the special-use permit. Generally, the lake is allowed to fill in the fall, winter, and part of the spring, and storage is discharged for irrigation purposes during the remainder of the year.

Despite the lack of a plan, attention to maintenance has been favorable since the 1968 dam reconstruction. The most significant maintenance problem indicated in inspection reports is the periodic accumulation of debris in the lake, along the face of the dam, at the entrance to the spillway, and, occasionally, in the spillway channel itself.

2.4.4 Warning System

There is no formal warning system or plan of action to warn downstream inhabitants or interests in the event of impending dam failure.

CHAPTER 3

FINDINGS AND RECOMMENDATIONS

3.1 FINDINGS

Visual inspection of South Meadow Creek Lake and Dam, supplemented by analysis of the project in terms of the recommended guidelines' performance standards, resulted in the following findings.

3.1.1 Size, Hazard Classification, and Safety Evaluation

According to the "Recommended Guidelines for Safety Inspection of Dams" (Ref. 1), South Meadow Creek Lake Dam is classified as intermediate in size with a high downstream hazard potential rating. The recommended spillway design flood (SDF) for this project is the probable maximum flood (PMF). The project can control only about 54% of the estimated 24-hour PMF volume. Because the project is incapable of controlling the full PMF without overtopping and causing the dam to fail, South Meadow Creek Lake Dam does not conform with the inspection guidelines with regard to the recommended storage and/or spillway capacity.

3.1.2 Embankment Dam

As noted in Section 2.3, the embankment appears to be in good condition. Although there is evidence of seepage, the sparse vegetative evidence suggests that seepage is not excessive. There is no internal drainage system in the embankment. Vegetative covering is very sparse, but erosion is not a problem.

There are no piezometers installed in the embankment or the foundation. The location of the phreatic surface is unknown.

Based on experience with similar structures and materials, the dam may conform to criteria in the inspection guidelines on stability; however, insufficient information is available to evaluate stability.

3.1.3 Spillway

The uncontrolled, earth and rock channel spillway was found to be in generally good condition with no serious erosion damage. Some sloughing was noted along the channel sides downstream from the crest. The log booms seem to be in good operating condition, and the spillway channel has very little debris.

3.1.4 Outlet Works

The irrigation outlet works were found to be in very good condition. The trash rack bars show some surface rusting. The concrete inlet structure has no noticeable deficiencies. The low-level outlet control works are

in very good operational condition, except for some minor leakage with the gate in the closed position. The concrete-encased, corrugated metal pipe has very little surface rust and no noticeable misalignment. However, only the exposed portion could be inspected. The concrete wing walls at the outfall have some surface chips but, otherwise, are in good condition.

3.1.5 Spillway and Reservoir Capacity

The lake storage capacity and spillway discharge capacity are insufficient to prevent overtopping during the estimated PMF. This investigation has determined that during the 24-hour PMP storm, the dam can handle approximately 54% of the estimated PMF volume with the control gate closed and approximately 55% of the PMF volume with the control gate open.

3.1.6 Operation and Maintenance

Operation and maintenance are performed by the owner, with technical assistance provided by the Forest Service. There is no formal operation plan for the reservoir. Water from spring runoff is stored in the reservoir and is released from the outlet as needed for irrigation. Consequently, the lake level fluctuates seasonally.

There is no formal maintenance plan for the dam, but the facility has a history of timely maintenance. The only current maintenance needs are rust removal and painting of the steel bars of the trash rack and of the steel bottom of the flow-measuring flume.

There is no formal warning system or plan of action to warn downstream inhabitants in the event of impending dam failure.

3.2 RECOMMENDATIONS

Due to the availability of storage between the normal pool and the dam crest, the present project provides a degree of flood protection to the downstream area. The intent of the recommendations in this report is to maintain or improve project safety, if feasible, without decreasing this existing flood protection.

1. Immediately develop, implement, and periodically test an emergency warning plan for use in the event of dam overtopping.

2. After removing all rust, use a proven rust-resistant paint system to paint all rusted metal on the trash rack and the flow-measuring flume.

3. Conduct more-detailed hydrologic and hydraulic routing studies to better determine the downstream hazard and required spillway capacity. Modify the project as studies indicate.

4. Investigate embankment conditions to verify design assumptions for stability. Studies should be performed by a geotechnical engineer experienced in the design and construction of earth dams.

5. Develop and implement a periodic maintenance plan for the dams and appurtenant structures. Because of the remoteness of the project site, the maintenance plan should include frequent condition inspections whenever water is impounded above the natural lake level.

6. Establish a program for periodic, comprehensive, safety inspections at no more than 5-year intervals. These inspections should be performed by engineers qualified in the design, construction, operation, and maintenance of earth dams.

Prior to performing engineering studies and remedial construction, coordinate all work with the U.S. Forest Service and the State of Montana Department of Natural Resources and Conservation to insure compliance with all pertinent laws and regulations.

REFERENCES

1. U.S. Army Corps of Engineers, Office of the Chief of Engineers, Report to the U.S. Congress, National Program of Inspection of Dams, Vol. 1, Appendix D, "Recommended Guidelines for Safety Inspections of Dams," Washington, D.C., Department of the Army, May 1975.

2. Howard, K. A., et al, "Preliminary Map of Young Faults in the United States as a Guide to Possible Fault Activity," U.S. Geological Survey, Reston, Virginia, 1978.

3. U.S. Geological Survey, "Earthquake Information Bulletin," Washington, D.C., 1973-1978.

4. U.S. Department of Commerce, Earthquake History of the United States, Publication 41-1, Washington, D.C.

5. U.S. Department of Agriculture, Soil Conservation Service, Engineering Division, Earth Dams and Reservoirs, Technical Release No. 60, June 1976.

6. U.S. Army Corps of Engineers, Office of the Chief of Engineers, "Wave Run-up and Wind Set-up on Reservoir Embankments," Engineer Technical Letter No. 1110-2-221.

7. U.S. Department of the Interior, Bureau of Reclamation, Design of Small Dams, Water Resources Technical Publication, U.S. Government Printing Office, Washington, D.C., 1974.

8. U.S. Department of Agriculture, Soil Conservation Service, "Average Annual Precipitation in Montana," Portland, Oregon, 1977.

9. Caprio, J. M., "Montana: Average Dates of Freeze," Folders No. 81, 82, and 83, Montana Agricultural Experiment Station, Montana State College, Bozeman, Montana, March 1965.

10. U.S. Department of Commerce, Weather Bureau, Generalized Estimates of Probable Maximum Precipitation for the United States West of the 105th Meridian, Technical Paper No. 38, U.S. Government Printing Office, Washington, D.C., 1960.

11. U.S. Department of Commerce, Weather Bureau, Probable Maximum Precipitation, Northwest States, Hydrometeorological Report No. 43, U.S. Government Printing Office, Washington, D.C., 1966.

12. U.S. Army Corps of Engineers, Hydrologic Engineering Center, Flood Hydrograph Package (HEC-1), Users' Manual for Dam Safety Investigations, Davis, California, September 1978.

(PHOTO 1) Overview, South Meadow Creek Lake Dam

(PHOTO 2) Upstream Face from Left Abutment

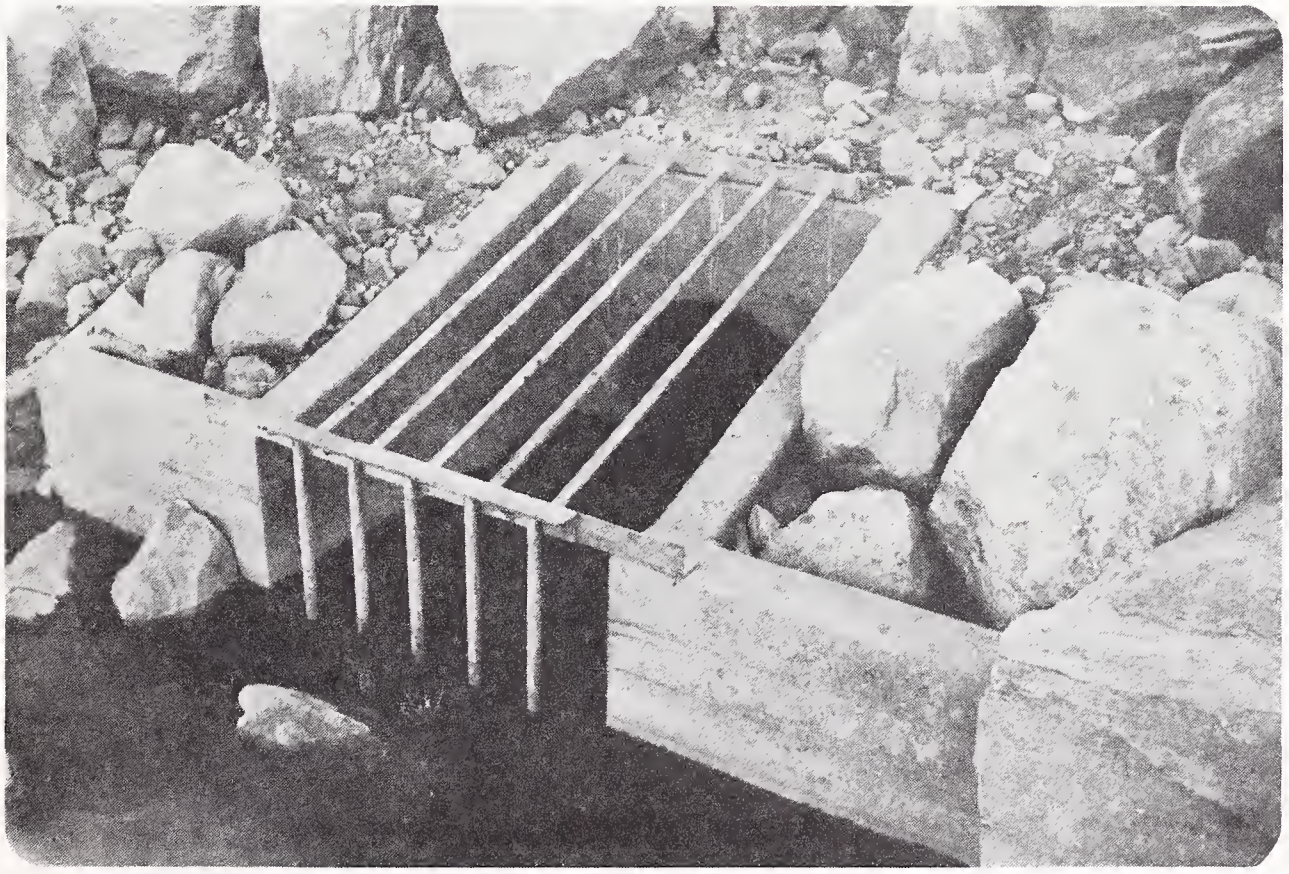
(PHOTO 3) Downstream Face from Left Abutment

(PHOTO 4) Borrow Area in Left Abutment

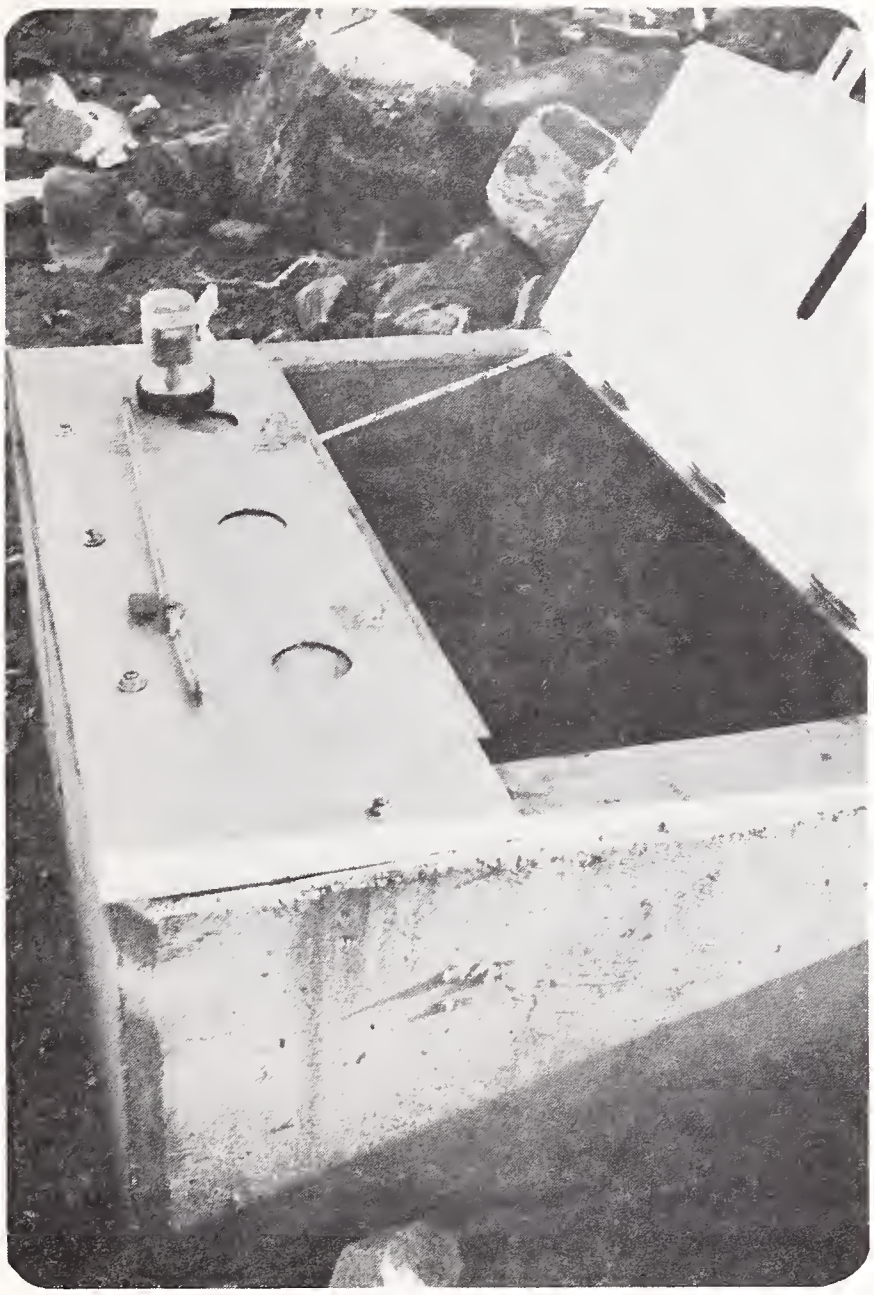
(PHOTO 5) Spillway Approach Channel, Looking Upstream

(PHOTO 6) Spillway Sill and Exit Channel,
Looking Downstream

(PHOTO 7) Spillway Exit Channel

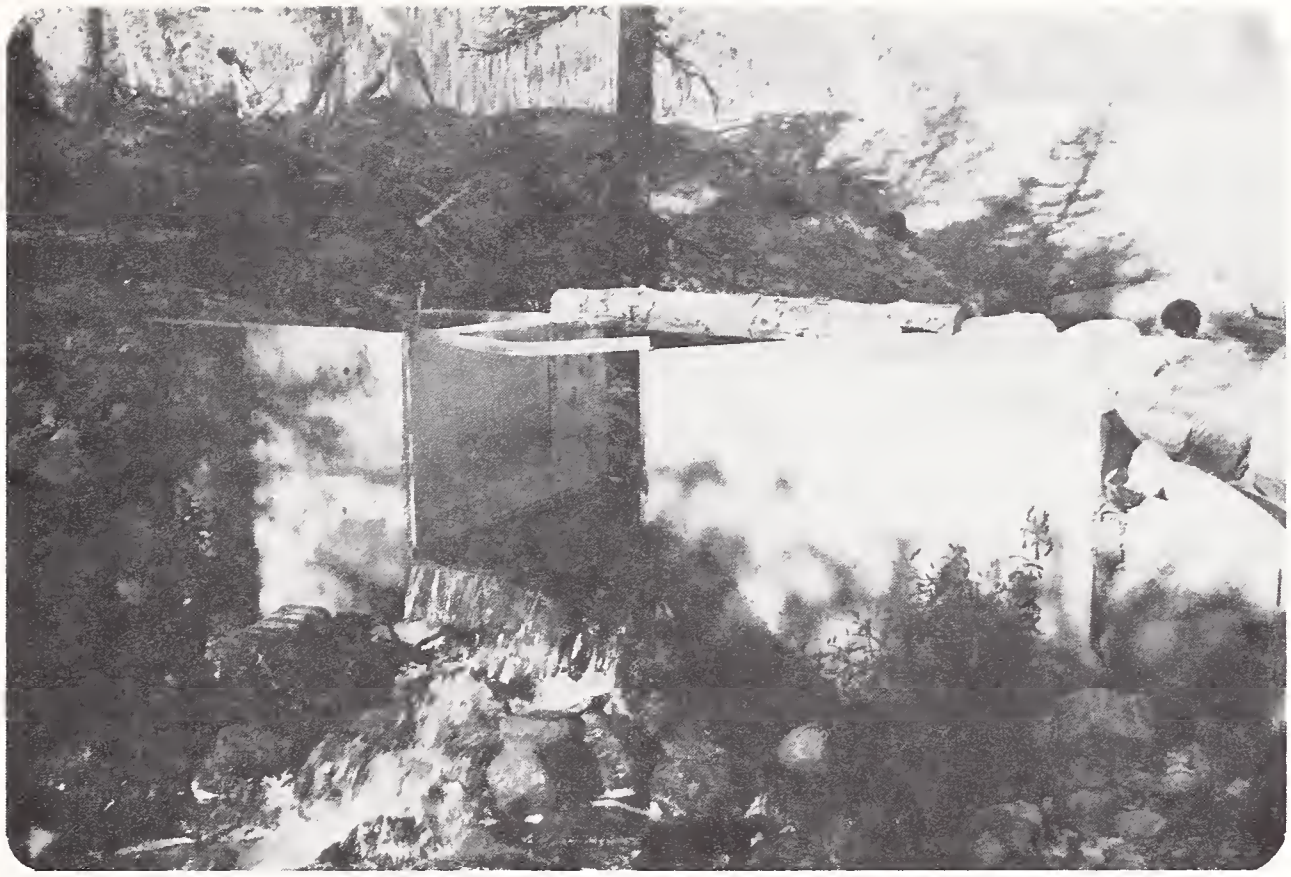


(PHOTO 8) Low-Level Inlet Structure and Trash Rack



(PHOTO 9) Low-Level Gate Well and Control Works on Berm

(PHOTO 10) Conduit Outlet and Downstream Face of Dam

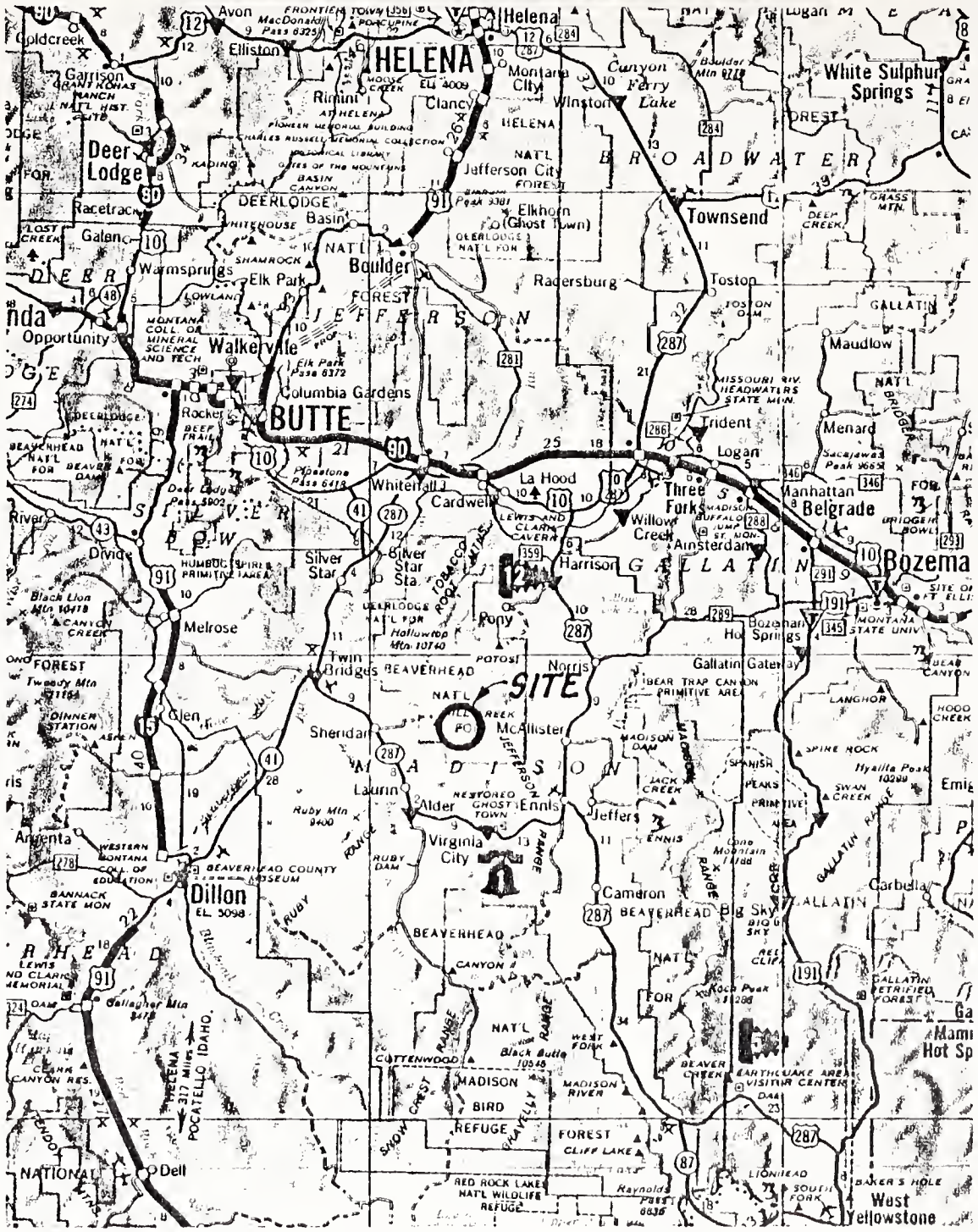


(PHOTO 11) Flow-Measuring Flume below Dam

(PHOTO 12) Downstream from Crest of Dam

(PHOTO 13) Reservoir and Drainage Area

SITE PLAN



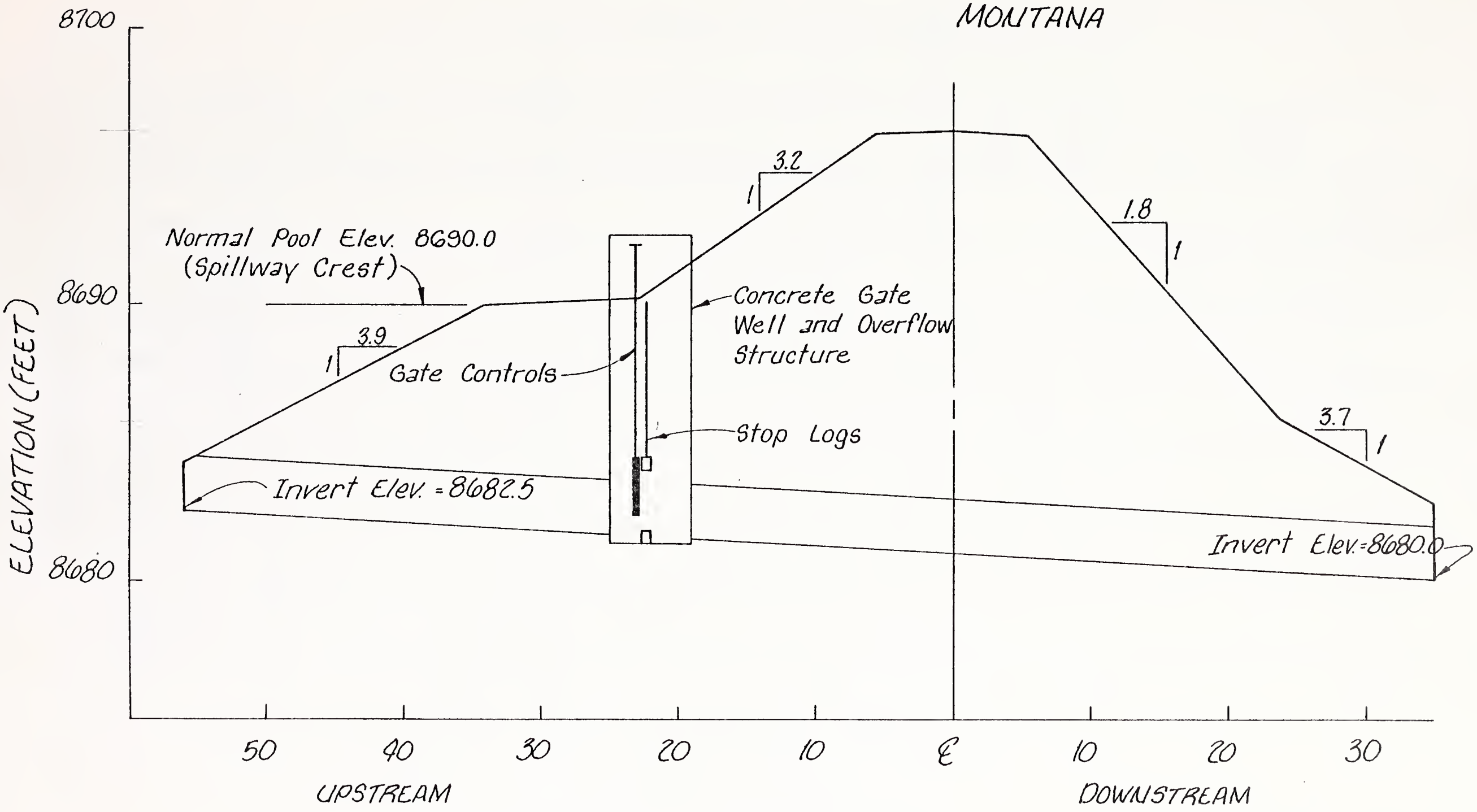
VICINITY MAP

PLATE 1

SOUTH MEADOW CREEK LAKE & DAM

SITE PLAN & VICINITY MAP

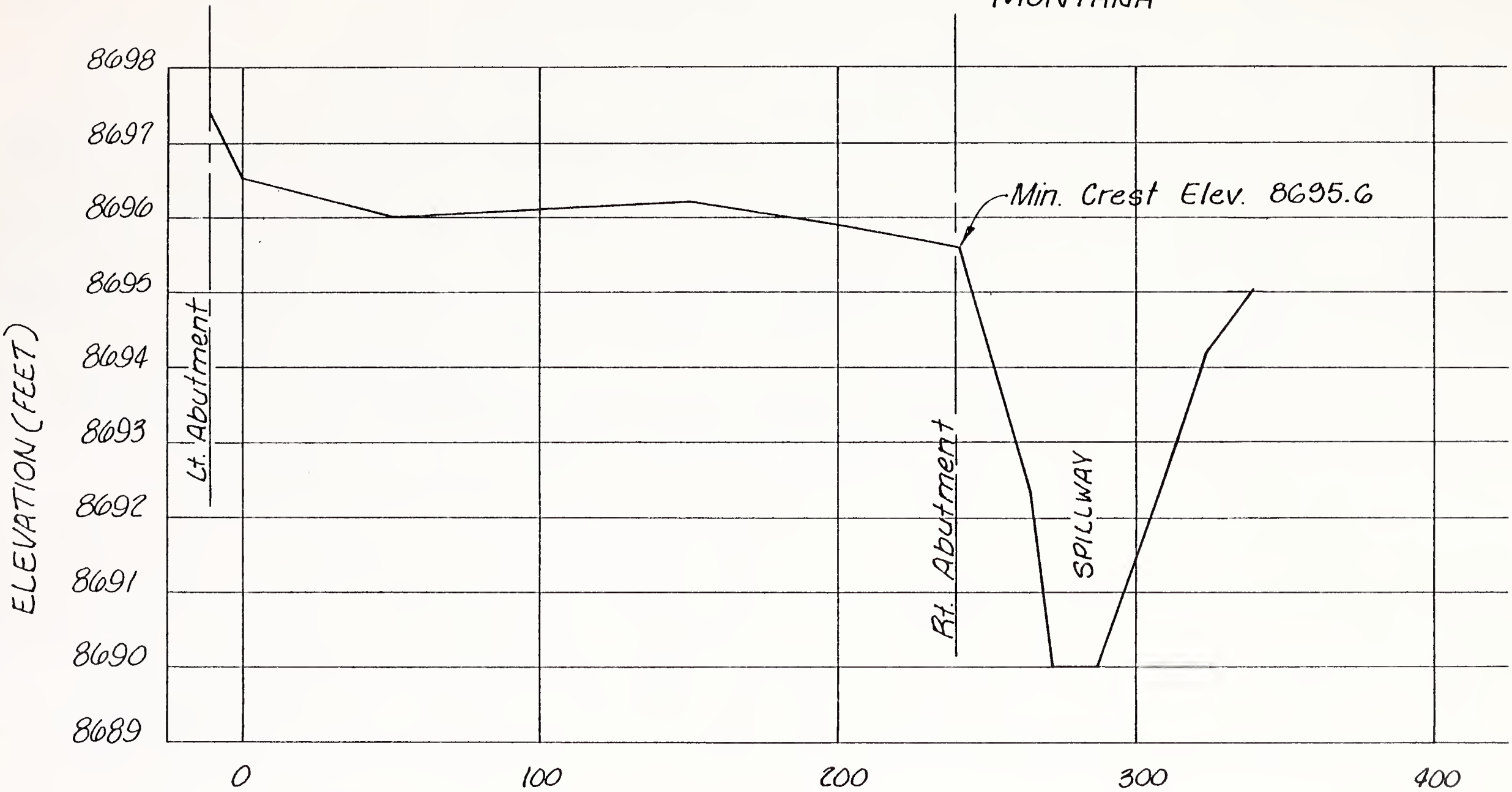
SOUTH MEADOW CREEK LAKE DAM
MONTANA



DAM CROSS SECTION AT OUTLET

PLATE 2

SOUTH MEADOW CREEK LAKE DAM
MONTANA



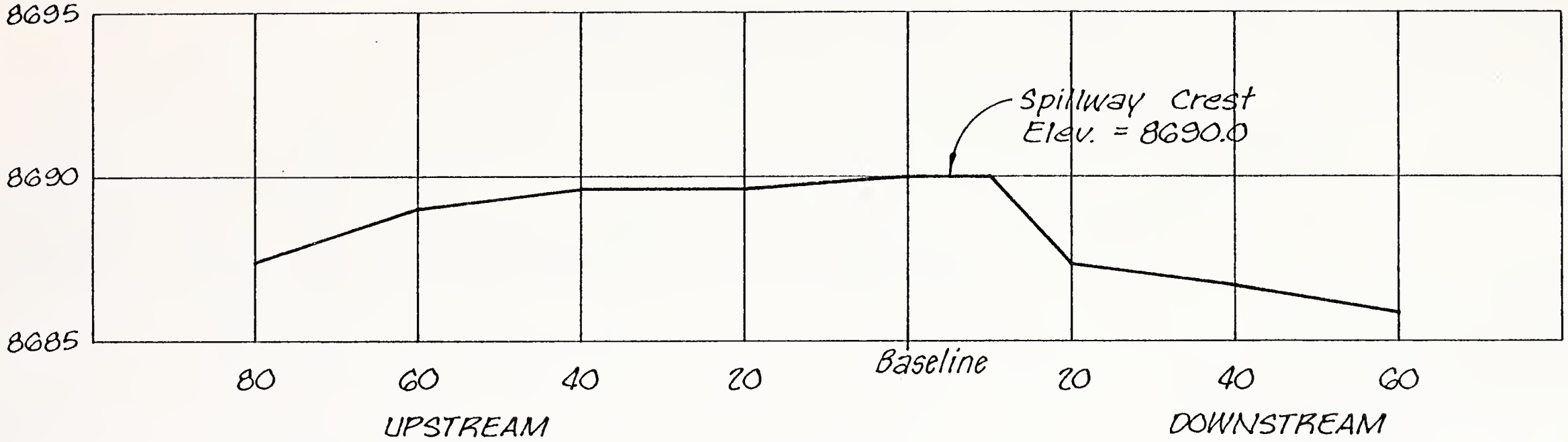
DAM CENTERLINE PROFILE

Scale: 1" = 2' (V.)
1" = 50' (H.)

PLATE 3

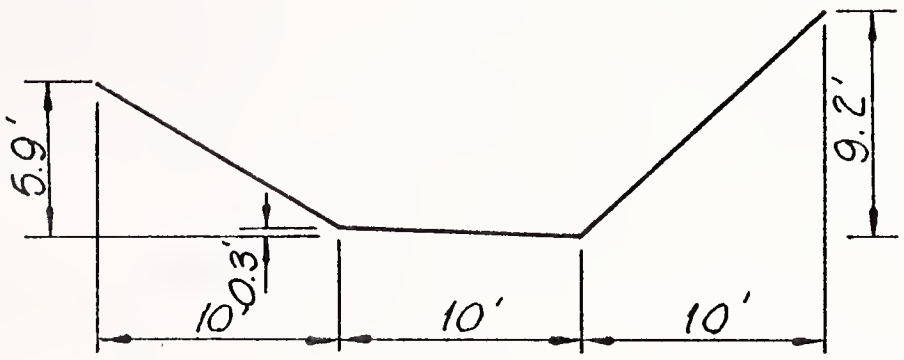
SOUTH MEADOW CREEK LAKE DAM

SPILLWAY

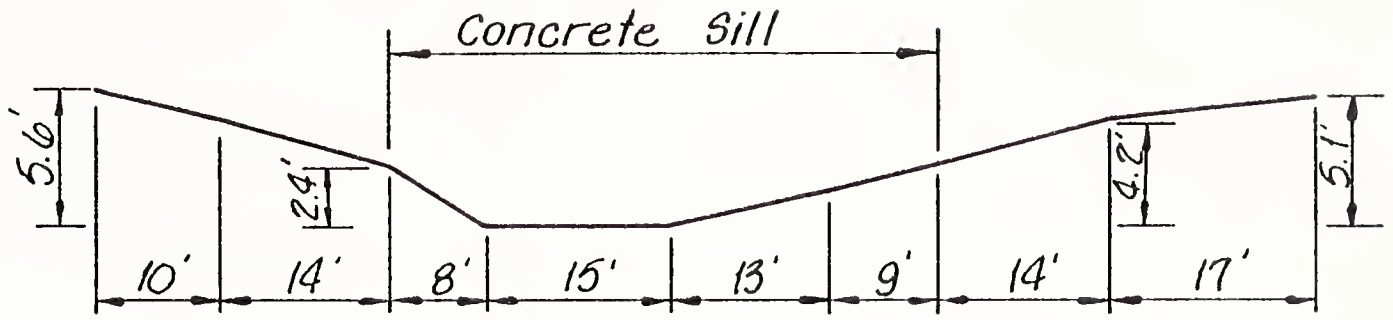


PROFILE OF SPILLWAY CENTERLINE

Scale: 1" = 20' (H.) ; 1" = 5' (V.)



TYPICAL CROSS SECTION
DOWNSTREAM OF CREST



CROSS SECTION AT THE CREST

PLATE 4

SURFACE AREA (ACRES)

90 80 70 60 50 40 30 20 10

8698
8696
8694
8692
8690
8688
8686
8684
8682
8680

ELEVATION (FEET)

Min. Top of Dam Elev. = 8695.6

Spillway Crest Elev.=8690.0

Elev. V.S. Vol.

Elev. vs. S.A.

0 200 400 600 800 1,000 1,200 1,400 1,600

STORAGE (ACRE-FEET)

ELEVATION - AREA & STORAGE CURVES
SOUTH MEADOW CREEK LAKE
MONTANA

PLATE 5

SPILLWAY DISCHARGE RATING CURVE
SOUTH MEADOW CREEK LAKE DAM
MONTANA

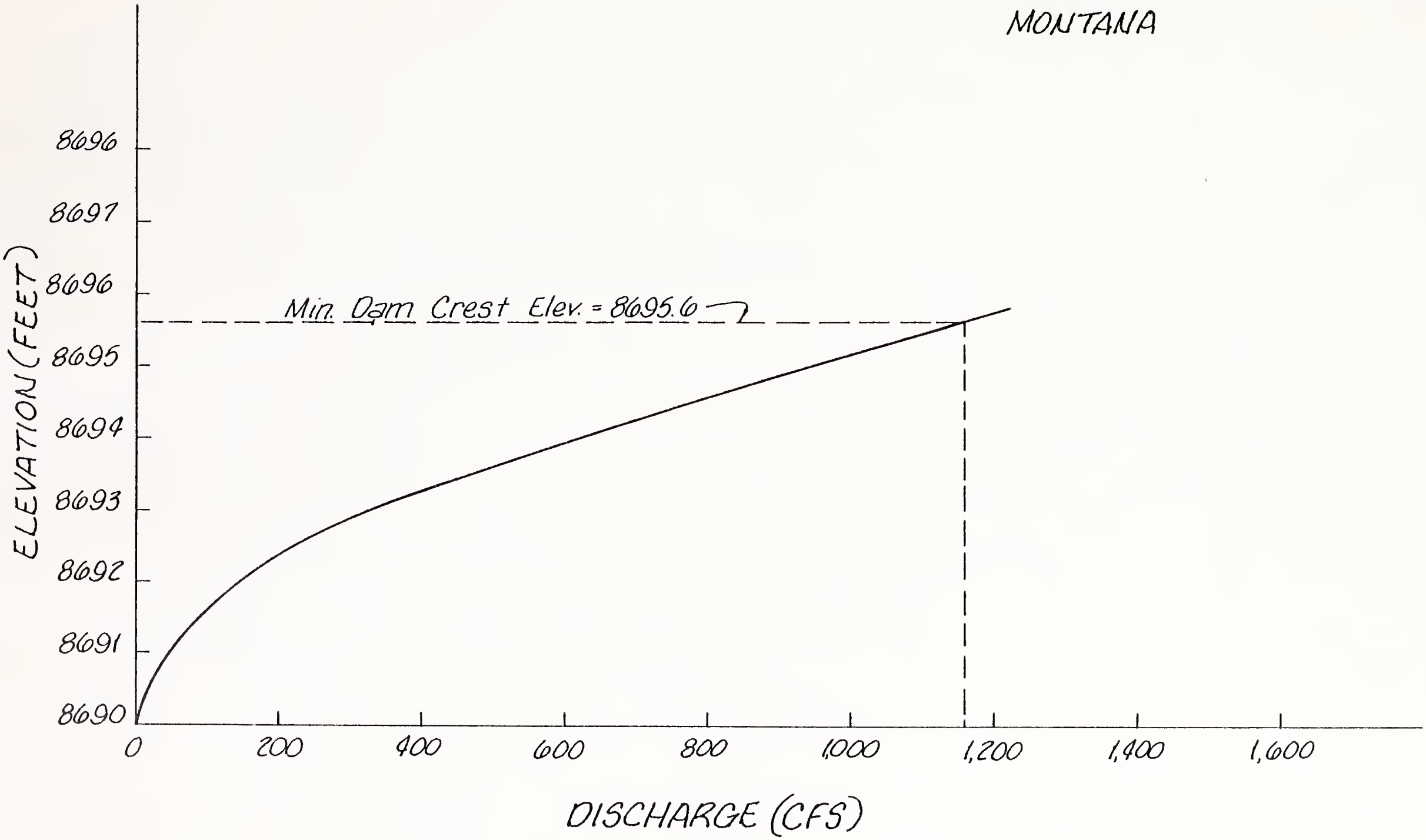


PLATE 6

24"CMP DISCHARGE RATING CURVE
SOUTH MEADOW CREEK LAKE DAM
MONTANA

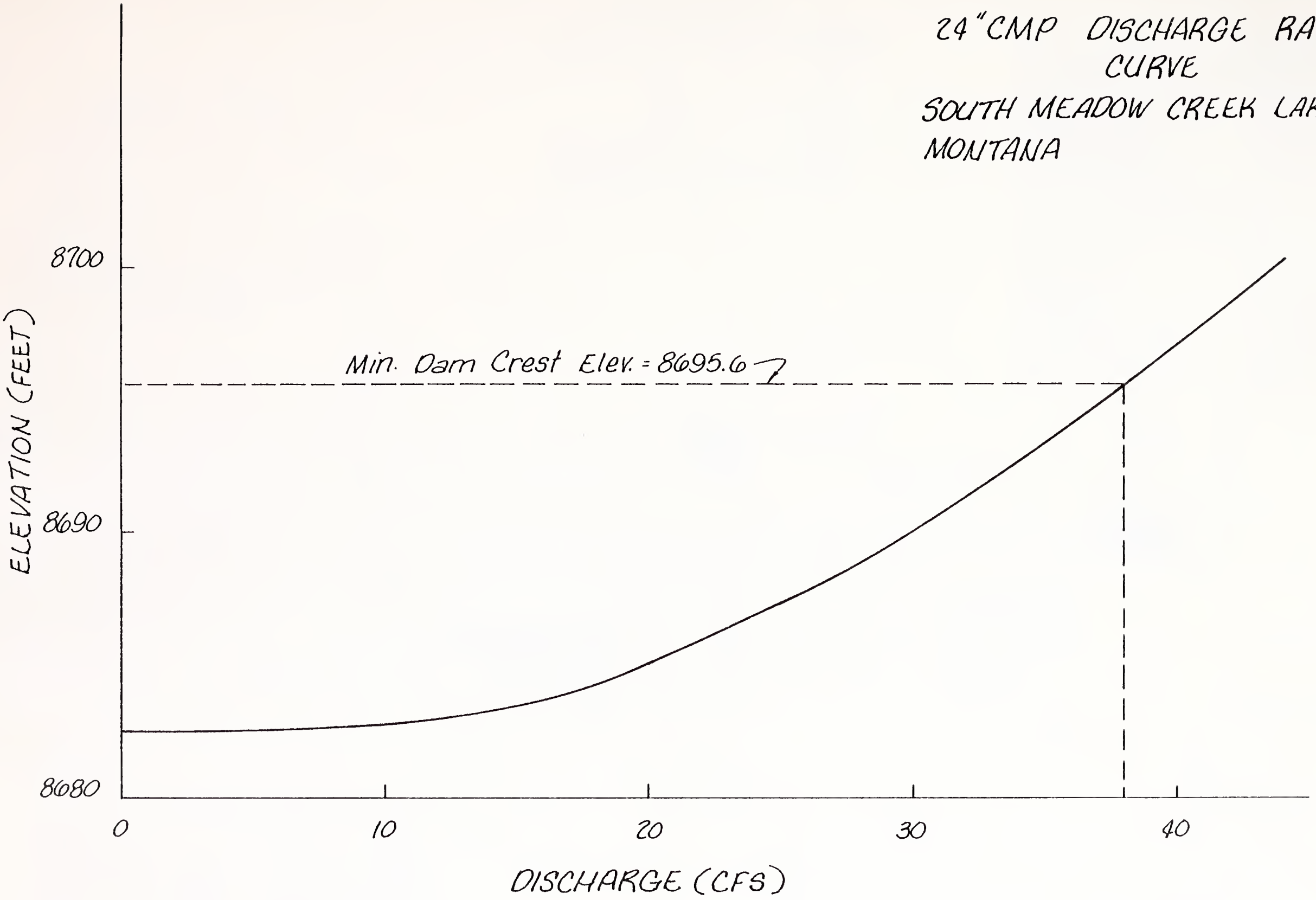
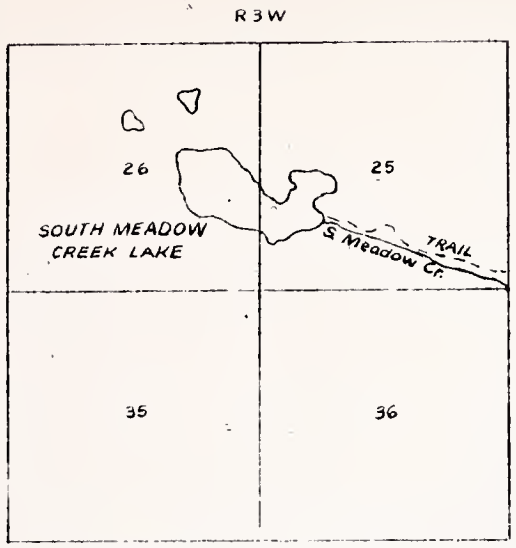


PLATE 7

Please Return to Boardwalk for Our Files -



GENERAL LOCATION MAP
Scale: 1:24,000

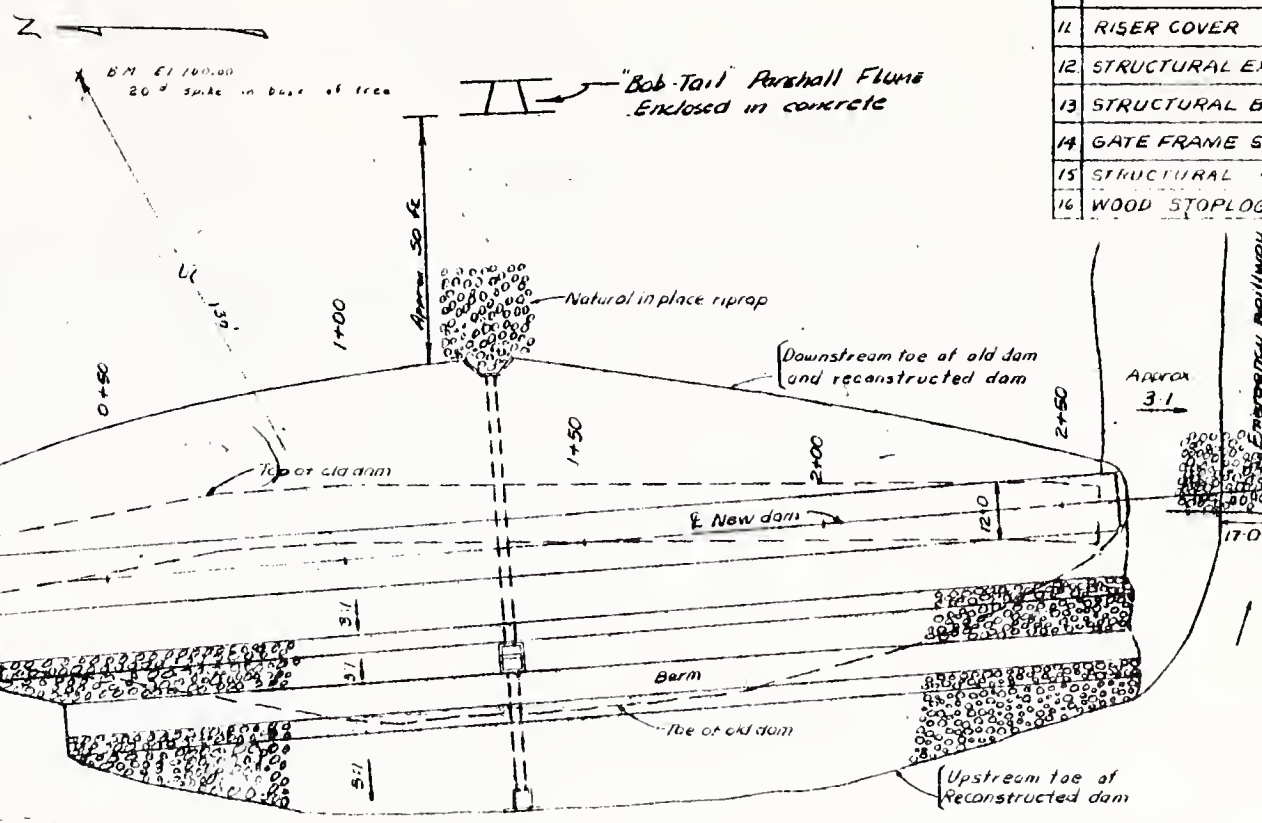
HYDROLOGIC DATA

DESIGN PEAK FLOW IN EMERGENCY SPILLWAY
(CLASS A, HIGH HAZARD, 100 YEAR STORM FREQUENCY)

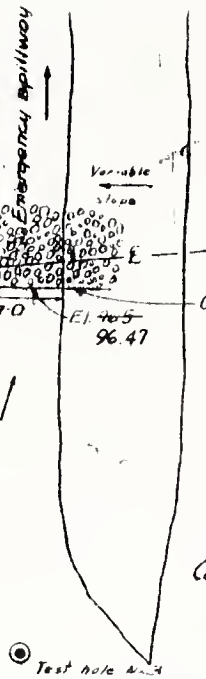
1. Drainage area		1.7 sq mi
2 Watershed flood producing factor (E)		
	Relief	0.38
	Soils	0.27
	Cover	0.18
	Surface storage	0.18
	Factor E	1.01
3 Discharge Q (base) =		100.0 cfs
4 Isohyetal factor If =		0.8
5. Frequency factor Ff =		1.9
6 Q peak = (Q base) (If) (Ff) = (100)(0.8)(1.9) =		152.0 cfs.
7. Peak discharge, CMS = $\frac{152}{17}$ =		8.94 csm

TABLE OF ESTIMATED QUANTITIES

	WORK	UNIT	QUANTITY	
1	EXCAVATION & FOUNDATION PREP.	CU.YD.	~~2560~~	2,333
2	EARTH FILL, Class B-2 compacted	CU. YD.	~~4800~~	2,937
3	RIPRAP, Remove and stockpile	CU. YD	250	
4	RIPRAP, Dumped rock 2' thick	SQ.YD	~~770~~	827
5	CONCRETE, Class B	CU YD.	~~27.5~~	30.4
6	REINFORCING STEEL	LBS	~~1686~~	1864.0
7	PIPE, 24" dia CM Pipe 14 ga close riveted and soldered	LIN FT	76.5	
8	GATE, Flat back metal slide 24" dia (Armco Model 101c or equal) 9 Ft. Frame	JOB	1	
9	TRASH RACK	JOB	1	
10	STOP LOG SLOTS	JOB	1	
11	RISER COVER	JOB	1	
12	STRUCTURAL EXCAVATION	CU YD	~~136~~	140
13	STRUCTURAL BACKFILL	CU YD	~~330~~	343
14	GATE FRAME SUPPORT	JOB	1	
15	STRUCTURAL REMOVAL	JOB	1	
16	WOOD STOPLOGS	BFM	80	



NOTE Existing log boom to remain in place



"As-built" changes ... by ... E. Lee Wilson ... marked 11-6-68 ... from original

As Builts in Red

Constructed According to plans & specs. (orig. signed by) I. J. NELSON PROJ ENGR, S.C.S 11-1-68

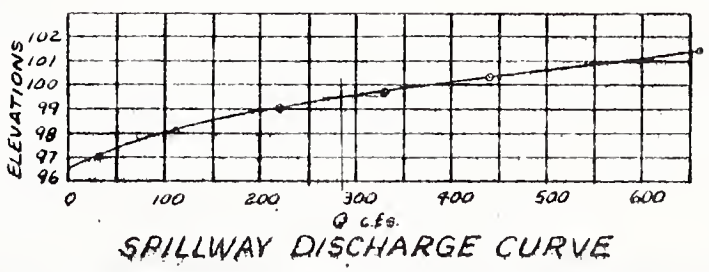
RECONSTRUCTED DAM
PLAN VIEW
Scale: 1" = 20'-0"

NOTE
All waste material shall be below El. 96.5

STAGE STORAGE DATA

STAGE ELEVATION FT	STORAGE AC FT
890 (Invert of outlet pipe)	0
900	81.58
910	163.76
920	246.54
930	329.92
940	413.90

STAGE ELEVATION	STORAGE AC FT
950	498.98
960	583.66
965 (Emergency Spillway El)	626.97
970	669.43
980	755.81



SPILLWAY DISCHARGE CURVE

REV 6-19-67

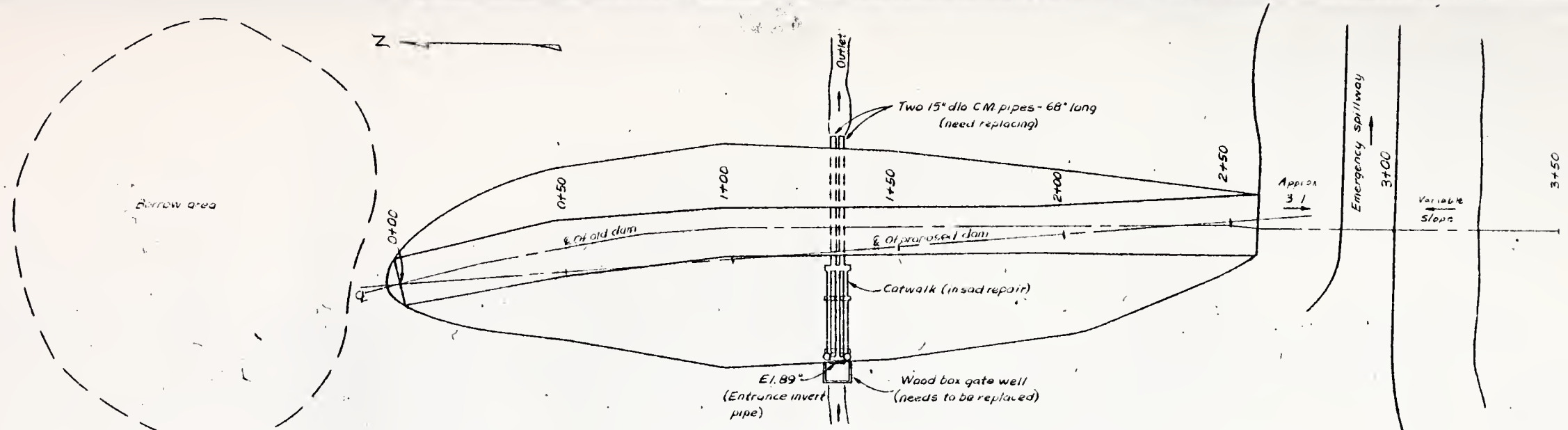
PLATE 8

SOUTH MEADOW CR LAKE
DAM REHABILITATION
MADISON COUNTY MONTANA

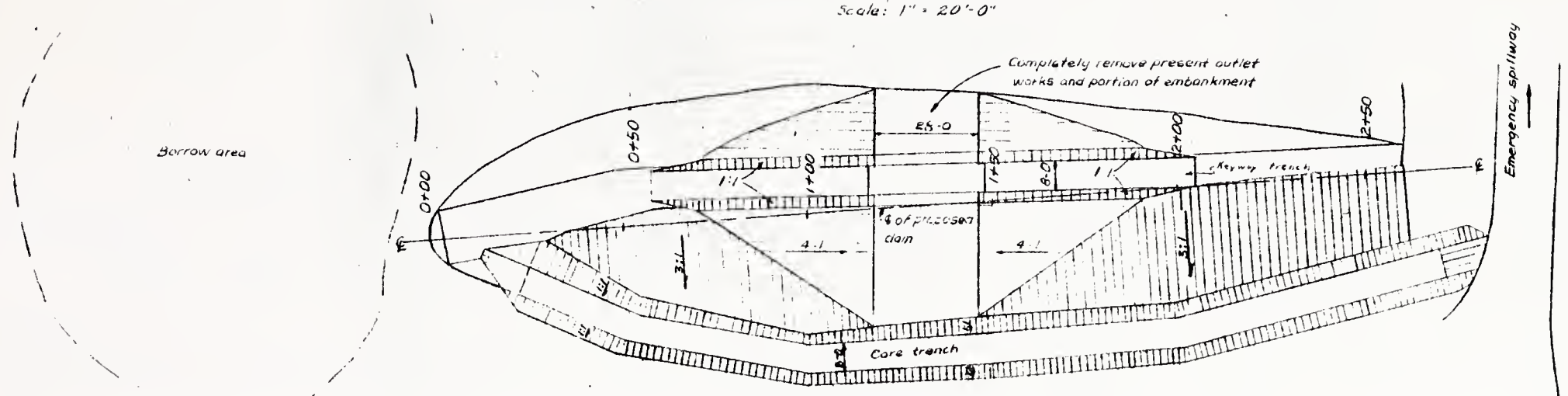
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed BBG, IJN	Date 1-67	Approved by E. W. Spurrier	
Drawn MK		Title	
Traced BK	1-67	Title	
Checked G.S. - B.S.	6-67	Sheet No 1 of 8	Drawing No MT E-06,100

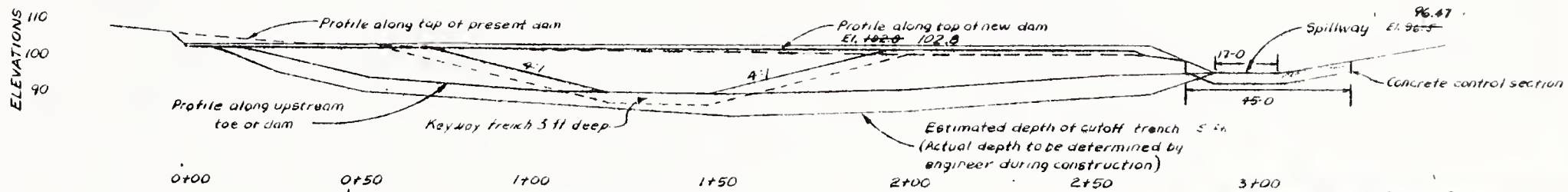
SCS-ENG-378 (APRIL 1962)



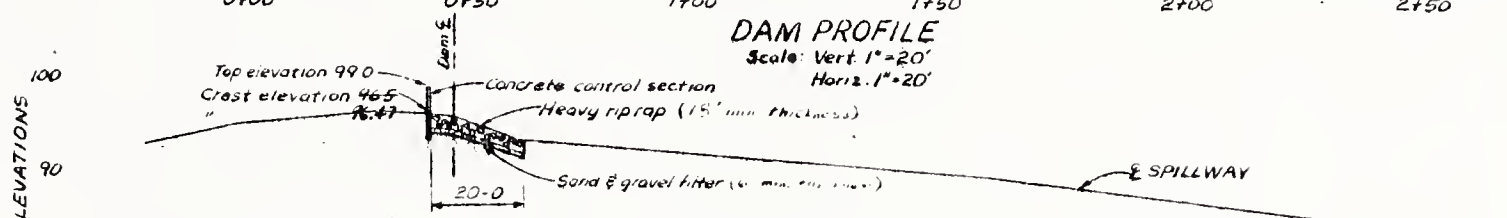
PLAN OF PRESENT DAM
Scale: 1" = 20'-0"



EMBANKMENT & FOUNDATION PREPARATION
Scale: 1" = 20'-0"



DAM PROFILE
Scale: Vert 1" = 20'
Horiz. 1" = 20'



Note: Existing bottom and side slopes of of the emergency spillway are to remain unchanged except for the addition of a concrete control wall and rock riprap.

SPILLWAY PROFILE
Scale: Vert 1" = 10'-0"
Horiz. 1" = 20'-0"

PLATE 9

SOUTH MEADOW CR. LAKE
DAM REHABILITATION
MADISON COUNTY MONTANA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

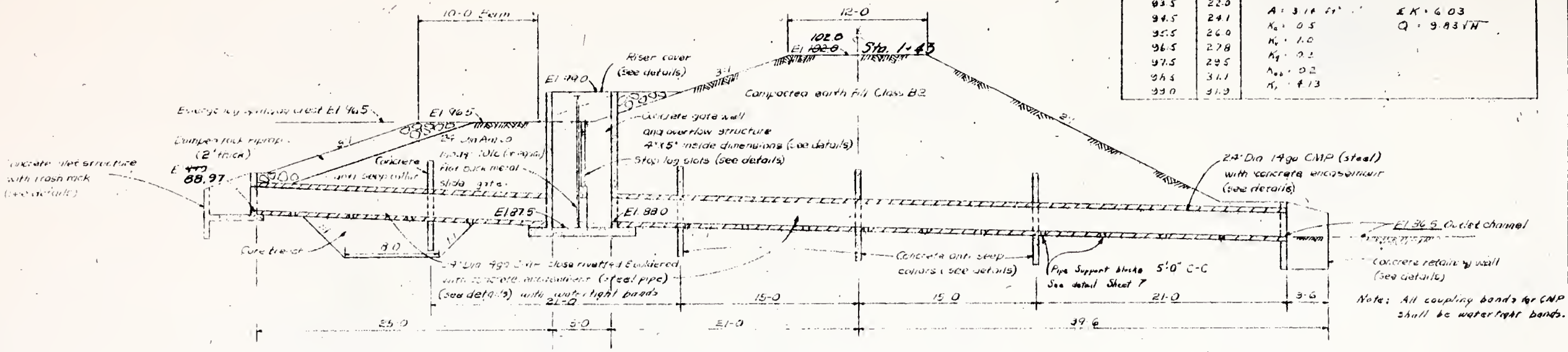
	Date		
Designed R.S.		Approved by J. K. Spencer	
Drawn W.L.	10-13-66	Title	
Traced R.S./M.K.	2-67	Title Sheet No. 2 of 8	Drawing No. MT. E-Okg.100
Checked G.K.	6-67		

Revised 6-18-67

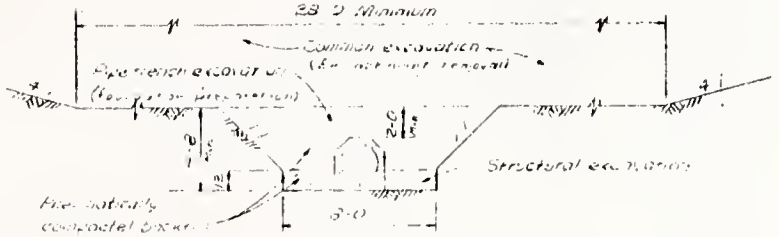
SCS-313 (9-64)

OUTLET WORKS
STAGE DISCHARGE DATA
(GATE FULLY OPEN)

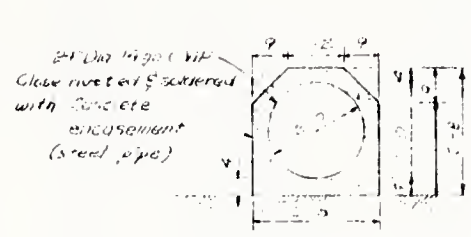
STAGE ELEVATIONS	Q cfs	EQUATIONS AND COEFFICIENTS
94.5	14.6	$Q = \frac{1}{\sqrt{\Sigma K}} A\sqrt{2gh}$
92.5	13.7	
93.5	22.0	$A = 3.14\ ft^2$ $\qquad \Sigma K = 6.03$
94.5	24.1	$K_a = .05$ $\qquad Q = 9.83\sqrt{H}$
95.5	26.0	$K_v = 1.0$
96.5	27.8	$K_g = .2$
97.5	29.5	$K_{ab} = .02$
98.5	31.1	$K_r = 4.13$
99.0	31.9	



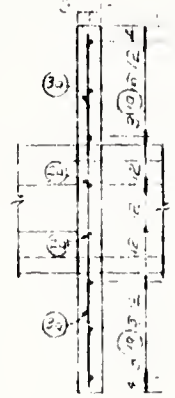
PROFILE ALONG ℄ OF IRRIGATION OUTLET WORKS
Scale: 1"=5'-0"



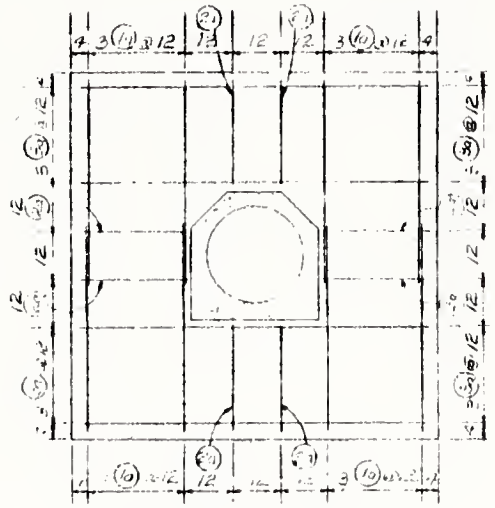
PIPE TRENCH EXCAVATION AND BACKFILL
Scale: 1"= 5'-0"



PIPE & CONCRETE ENCASEMENT
Scale 1/2"=1'-0"

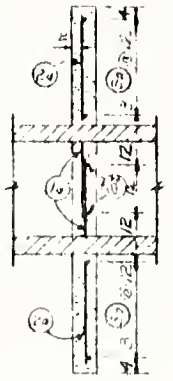


PLAN
Scale 1/2"=1'-0"

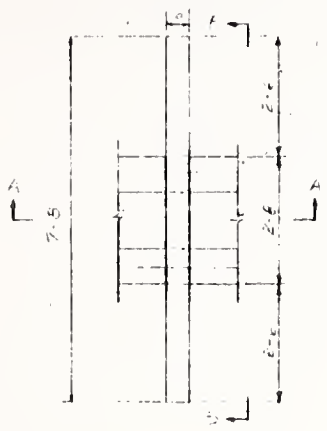


ELEVATION B-B
Scale 1/2"=1'-0"

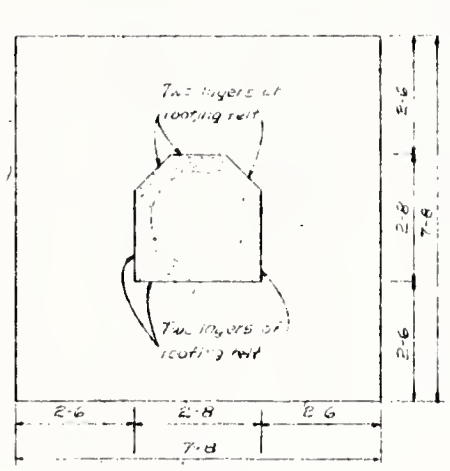
ANTI-SEEP COLLAR REINFORCEMENT



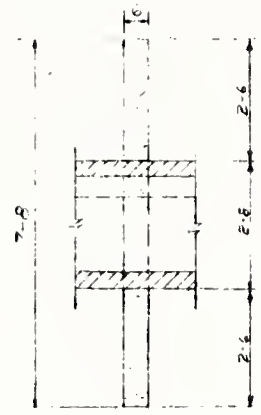
SECTIONAL ELEVATION A-A
Scale 1/2"=1'-0"



PLAN
Scale 1/2"=1'-0"



ELEVATION B-B
Scale 1/2"=1'-0"



SECTIONAL ELEVATION A-A
Scale 1/2"=1'-0"

ANTI-SEEP COLLAR DETAILS

Rev 6-14-67

PLATE 10

PROFILE ALONG ℄ OF OUTLET WORKS
SOUTH MEADOW CR LAKE
DAM REHABILITATION
MADISON COUNTY MONTANA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	KS-BBG	Date 2-67	Approved by [illegible]
Drawn	[illegible]	6-6	Title
Traced			Title
Checked	G.K.	6-6	Sheet No 9 of 8
			Drawing No MT.E-06,100

SCS-312 (9-64)

DEPARTMENT OF NATURAL RESOURCES
AND CONSERVATION
WATER RESOURCES DIVISION

TED SCHWINDEN, GOVERNOR

32 SOUTH EWING

STATE OF MONTANA

(406) 449-2872 ADMINISTRATOR
(406) 449-3962 WATER RIGHTS BUREAU
(406) 449-2872 WATER SCIENCES BUREAU
(406) 449-2864 ENGINEERING BUREAU
(406) 449-2872 WATER PLANNING BUREAU

HELENA, MONTANA 59620

February 27, 1981

Department of the Army
Seattle District, Corps of Engineers
P.O. Box C-3755
Seattle, Washington 98124

Attn: Ralph Morrison

Re: Hoskins-Western-Sonderegger, Inc. Dam Safety Inspection
Report on South Meadow Creek Lake Dam (MT-527)

Dear Ralph:

We have reviewed the above referenced final draft report. We concur with the findings and recommendations and find that it satisfies the criteria of the Phase I report.

Minor editorial comments have been discussed with your staff, and we understand these will be incorporated in the final report.

Thank you for the opportunity to review and comment on the final draft report on South Meadow Creek Lake Dam.

Sincerely,

Richard L. Bondy

Richard L. Bondy, P.E.
Chief, Engineering Bureau
(406) 449-2864

RB:AT:lj

"AN EQUAL OPPORTUNITY EMPLOYER"

United States
Department of
Agriculture

Soil
Conservation
Service

P.O. Box 970
Bozeman, MT
59715

March 2, 1981

Sidney Knutson, P.E.
Assistant Chief
Engineering Division
Seattle District Corps of Engineers
P.O. Box C-3755
Seattle, WA 98124

Dear Mr. Knutson:

Thank you for the opportunity to review the final draft report on South Meadow Creek Dam (MT-527).

Our comments relating to specific report statements are:

Page iii, line 22, and Page 5, line 11: These paragraphs should give more emphasis to the need for more realistic detailed study to support any project modification.

Page i, line 22, Page 5, line 11: There are more than ten inhabitable structures below the dam, but only 3 or 4 are susceptible to hazardous flood flows. Page ii, line 15: The statement that "failure could endanger the lives of many people and cause considerable property damage" is not substantiated in the report. The hazard is exaggerated. The first residence is 5.5 miles downstream, 20-30 feet above the creek at a point where the floodplain widens to the Madison Valley. Two and a half miles further downstream two or three houses would be flooded at non-life threatening depths. The dam is short on a short terminal moraine, both consist of a sandy silt matrix with gravel, cobble, and boulders. Overtopping would not create a sudden breach, as the rock and narrow outlet section would throttle the outflow.

Page 17, Section 2.3.2: The seepage has been observed during full reservoir conditions. The seepage is a minimal amount, is not concentrated, and is clear.

General Comments:

We request that the meteorologic and hydrologic assumptions and conditions be fully presented and justified in the report.

We do not feel the meteorologic and hydrologic conditions used to develop the PMF are realistic. The conditions selected attempt to eliminate the element of risk to a degree that we feel is not practical or reasonable.

We urge that a breach flood routing and a substantiated hazard classification be made in the Phase I inspection. By such a brief field overview, general

hydrologic modeling and a subjective hazard analysis, the report is forcing an, as yet, unjustified economic burden of a Phase II inspection on the dam owners.

Sincerely,

Alan H. Loomis

for Van K Haderlie
State Conservationist

cc:
Ray Smith, State Conservation Engineer, SCS, Bozeman
Dave Jones, Environmental Engineer, SCS, Bozeman

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
FEDERAL BUILDING MISSOULA, MONTANA 59801

7530
FEB 17 1981

Sidney Knutson, P.E.
Assistant Chief, Engineering Division
Seattle District Corps of Engineers
P.O. Box C-3755
Seattle, WA 98124

Dear Mr. Knutson:

We have reviewed the draft report on the Phase I study of South Meadow Creek Dam and have the following comments:

We agree a more detailed hydrologic study is needed to better determine the hazard this dam presents and believe any expenditures of funds for further investigation would depend on the conclusions of such a study.

Sincerely,

Beryl Johnston

BERYL JOHNSTON
Acting Director
Engineering

cc: Beaverhead NF

McAllister, Mt.
Feb. 16, 1981

Sidney Knutson, P.E.
Asst. Chief, Engineering Division
Dept. of the Army
Seattle Dist., Corps of Engineers
P.O. Box C-3755
Seattle, Wn. 98124

Dear Mr. Knutson,

This is in response to your letter of Jan. 23, 1981 enclosed with the Phase I Inspection Report on South Meadow Creek Lake Dam, asking for comments on this report. On Feb. 12 a Mr. Berg of the Corps of Engineers telephoned from Seattle, and briefly discussed the report, stating that the inspection was very limited by time, and also that they considered the dam to be in very good condition, and in his opinion only minor improvements would be required.

The South Meadow Creek Lake Dam was built according to government specifications Forest Service, SCS and FHA engineers were on the site during construction. Annual inspections have been conducted by qualified engineers, and it met with their approval. Yearly maintenance work has been done.

If there is some doubt about its soundness, the Corps of Engineers should take time to make a more complete inspection.

I (Ora Magee) have been involved with this dam personally since 1926. I am member of the corporation and for the ditch rider make a trip to the dam on an average of once a week during the irrigating season, beginning in the spring.

Ora A. Magee Pres.
Doris J. Bikerman Sec. Treas.